

# New Fruit monitoring quality technology

For the whole Horticulture value chain

Initiative: “Horticulture Innovation Funds”

Dario Stefanelli<sup>1</sup>, Daniele Pelliccia<sup>2</sup>, Nick Parris<sup>3</sup>

<sup>1</sup> Agriculture Victoria Research, Bundoora

<sup>2</sup> Rubens Technologies, Victoria

<sup>3</sup> A.C.N. Orchards Banbartha

Contact: [dario.stefanelli@agriculture.vic.gov.au](mailto:dario.stefanelli@agriculture.vic.gov.au)



# Industry quality monitoring concerns

- Need to identify optimal harvest date
- Current method (Firmness and Soluble Solids) not sufficient to determine correct physiological stage

## CURRENT SOLUTIONS

- DA-Meter, identifies physiological stage but difficult to manage the data
- New Fluorescence technology

# Identification of stone fruit maturity classes using $I_{AD}$ (DA meter)

- Harvest at best maturity to suit specific markets
- Cultivar specific
- Correlate  $I_{AD}$  value with fruit ethylene production
  - Ethylene production related to fruit maturity (ripeness)
- Can be conducted in the field or pack house
- New ethylene sampling protocol in Australian Stonefruit Grower – August 2016



# Horticulture Innovation Fund Initiative

- DA-Meter new software for data management:
  - Allows import of data from micro memory card
  - Allows separation by block, cultivar, training system, etc
  - Allows creation of graphs for the current season (maturity development)
  - Allows creation of graphs between seasons (comparison in predictive mode)
  - Still in beta testing
  - Should be ready around December
  - YouTube explanatory videos placed on HIN website

# Selecting the data to plot

DAsoftware

File Edit

Filter

Season [v]  
Date From 2000/01/01 [v]  
Date To 2019/08/11 [v]  
Marker [v]  
Cultivar [v]  
Block [v]  
Clear

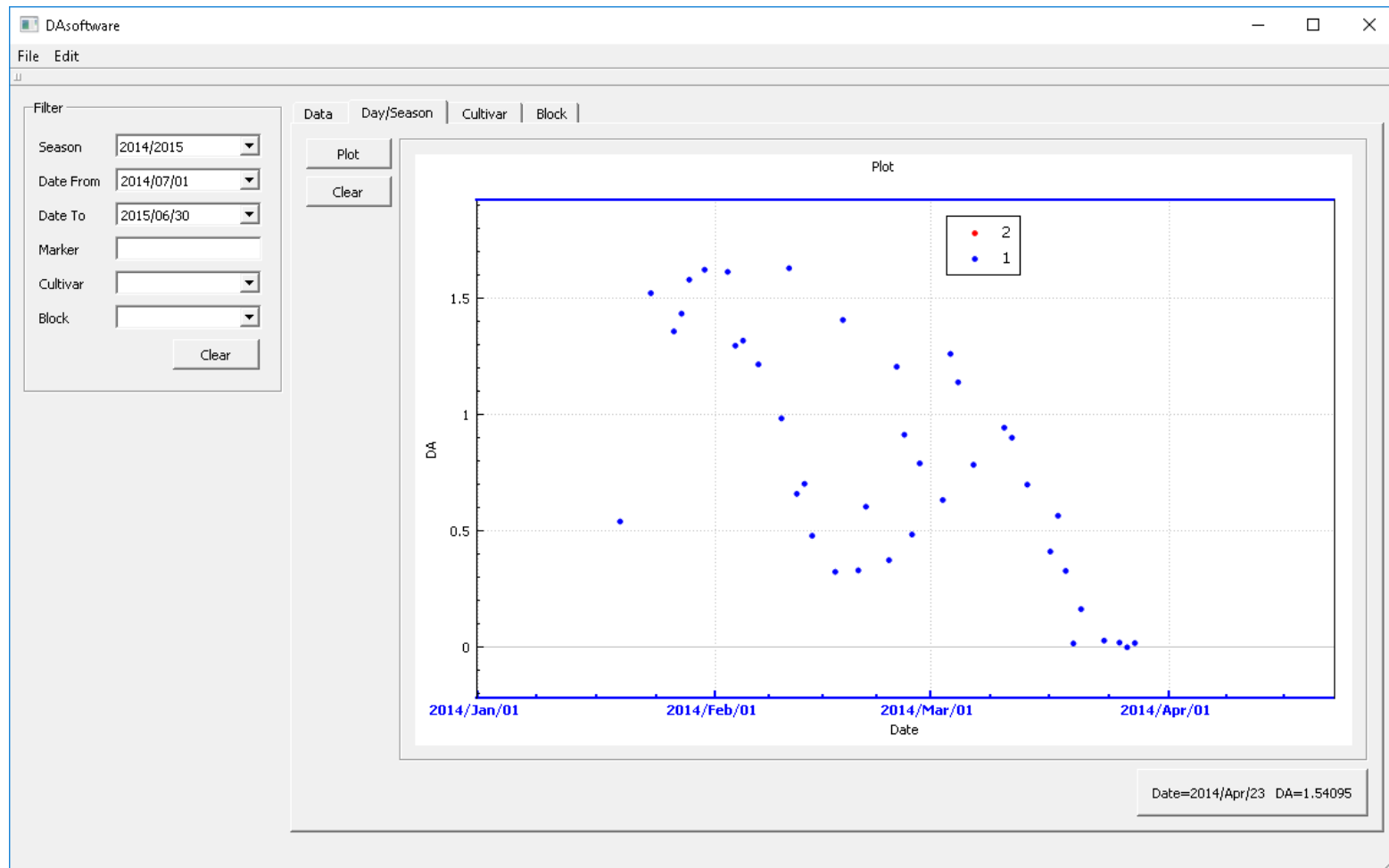
Data | Day/Season | Cultivar | Block |

Apply Filter  
Clear Filter

#	DATE	TIME	MARKER	CULTIVAR	BLOCK	DA
112	2016/03/01	08:00:47	436	Granny Smith	Block 1	0.5496
113	2016/03/01	08:00:52	436	Granny Smith	Block 1	0.1036
114	2016/03/01	08:00:57	436	Granny Smith	Block 1	0.1382
115	2016/03/01	08:01:03	436	Granny Smith	Block 1	0.2411
116	2016/03/01	08:01:08	436	Granny Smith	Block 1	0.395
117	2016/03/01	08:01:14	436	Granny Smith	Block 1	0.1251
118	2016/03/01	08:01:20	436	Granny Smith	Block 1	0.182
119	2016/03/01	08:02:17	437	Granny Smith	Block 1	0.158
120	2016/03/01	08:02:22	437	Granny Smith	Block 1	0.1868
121	2016/03/01	08:02:27	437	Granny Smith	Block 1	0.0925
122	2016/03/01	08:02:31	437	Granny Smith	Block 1	0.2918
123	2016/03/01	08:02:36	437	Granny Smith	Block 1	0.236
124	2016/03/01	08:02:43	437	Granny Smith	Block 1	0.076
125	2016/03/01	08:02:47	437	Granny Smith	Block 1	0.3907
126	2016/03/01	08:02:51	437	Granny Smith	Block 1	0.1818
127	2016/03/01	08:02:56	437	Granny Smith	Block 1	0.2747
128	2016/03/01	08:03:00	437	Granny Smith	Block 1	0.2705

Export Data Clear Data

# Seasonal plot



# Horticulture Innovation Fund Initiative

- Three Chlorophyll Fluorescence Technology based sensors:
  - hand-held sensor to be used in conjunction with a smartphone app, that will enable pre-harvest maturity monitoring and enable harvest prediction based on spectral data and other parameters (such as GPS localisation)
  - Sensor to monitor conditions of fruit in real time during cold storage, especially during long term period required by pome fruit
  - Sensor designed for the graders and packing lines (at prototype stage)
- Data from the three sensors can be shared across the value chain, so that it will be possible to follow fruit quality from tree to consumer
- YouTube explanatory videos placed on HIN website

## Hand Held sensor

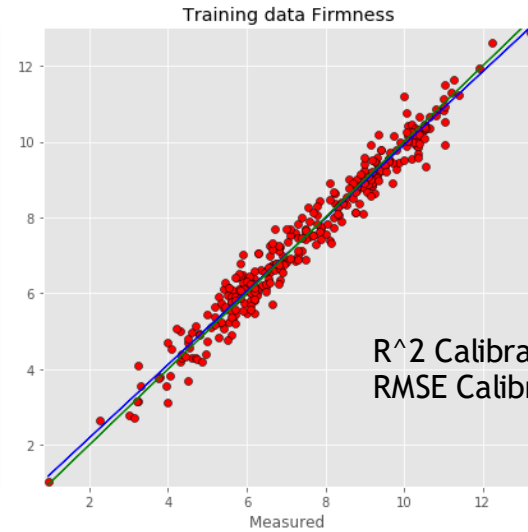
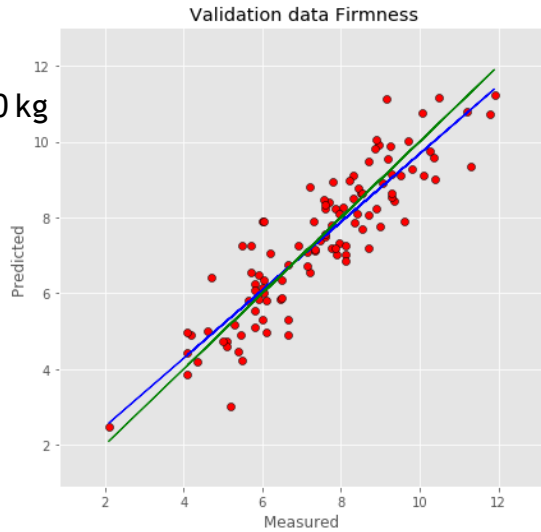
- High correlation with flesh firmness, soluble solids concentration and maturity.
- Workable on smartphone APP
- Allows to make own calibration to further improve quality
- Allows for cultivar specificity
- Tested on peach, nectarine and apple
- Correlates with  $I_{AD}$  values (ethylene development)



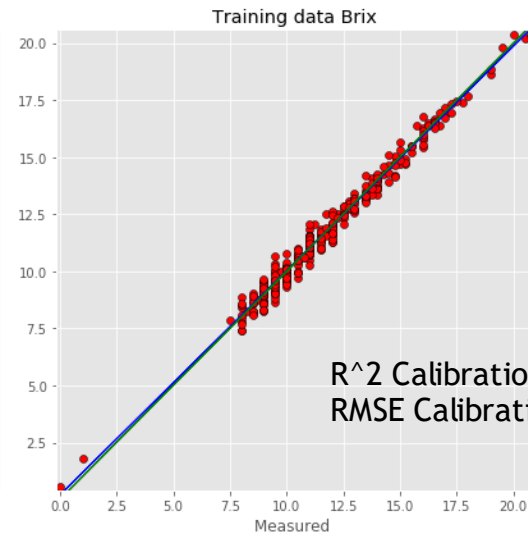
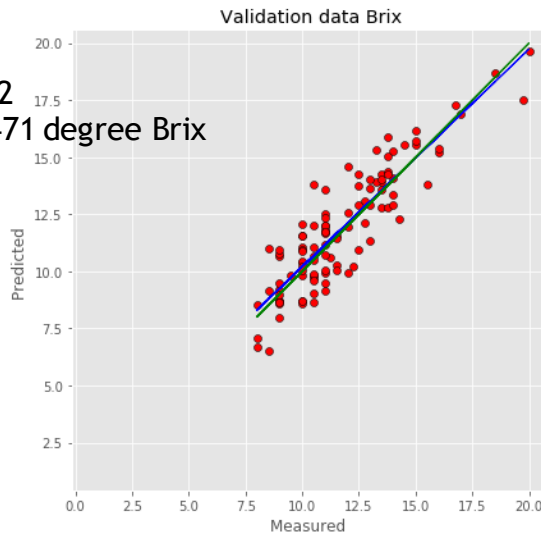


# High correlation with Flesh Firmness and Brix

R<sup>2</sup> Prediction: 0.822  
RMSE Prediction: 0.790 kg

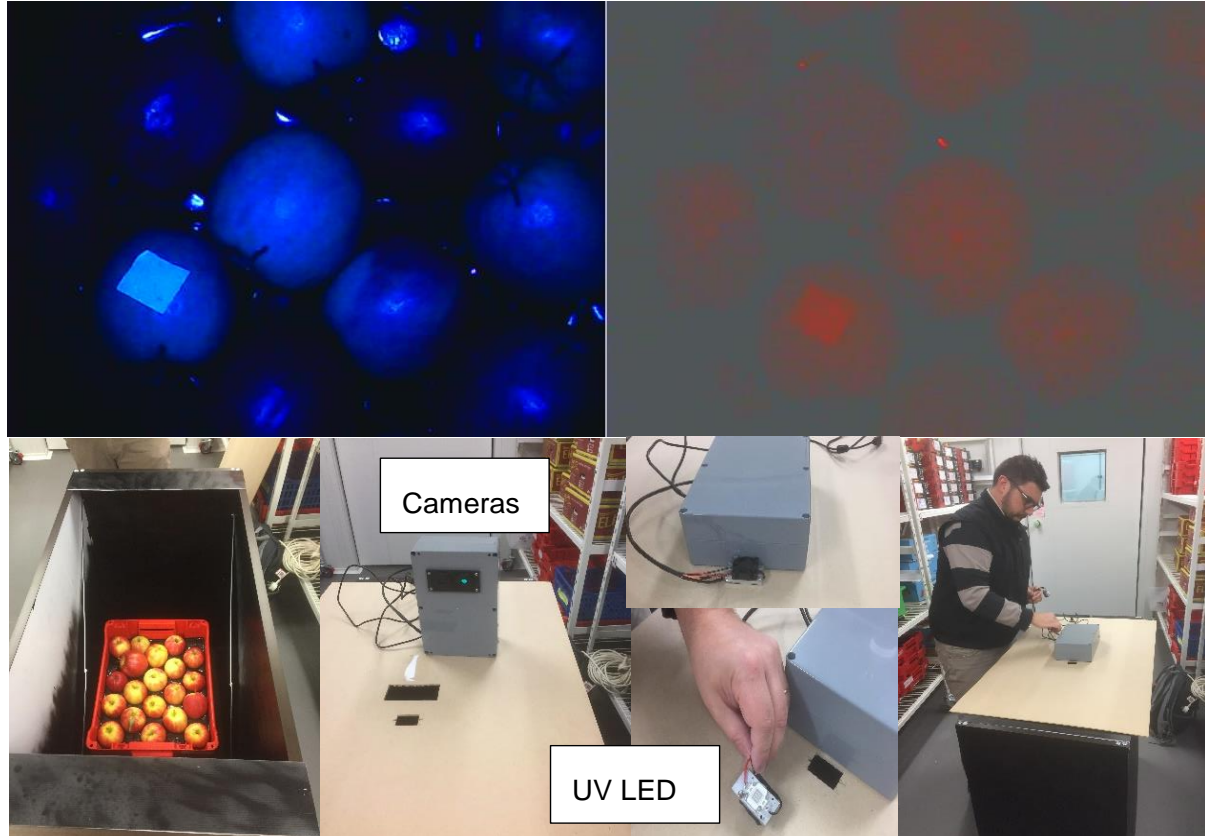


R<sup>2</sup> Prediction: 0.632  
RMSE Prediction: 1.471 degree Brix



# Cold storage sensor

- Based on image capture of chlorophyll fluorescence
- Allow s for long term monitoring
- Tested on apple
- Requires further testing on other fruit type and image resolution



# New technologies to monitor fruit quality

Improve orchard monitoring during fruit development

Important to understand and predict optimal harvest  
(no ethylene = no harvest)

Identification of market of choice based on fruit quality at packing

Improved monitoring during postharvest

Provide a solution for fruit quality management along the whole value chain

More monitoring = more understanding = better planning = improved  
whole farm logistics = HIGHER PROFITABILITY

Both technologies have the same base concept and utilisation protocols  
<http://www.hin.com.au/networks/profitable-stonefruit-research#videos>

# Thank you

## QUESTIONS?

- ACN Orchards Bunbartha:
  - field testing on stone and pome fruit for the hand held instrument
- Rubens Technology Ltd:
  - Sensors Development; software/APP development; testing and proofing of predicting correlation accuracy and robustness
- Agriculture Victoria Research:
  - sensors testing; scientific provider for predicting correlation accuracy and robustness
- Biosecurity Agricultural Services
  - YouTube videos and HIN webpage management
- Horticulture Innovation Funds

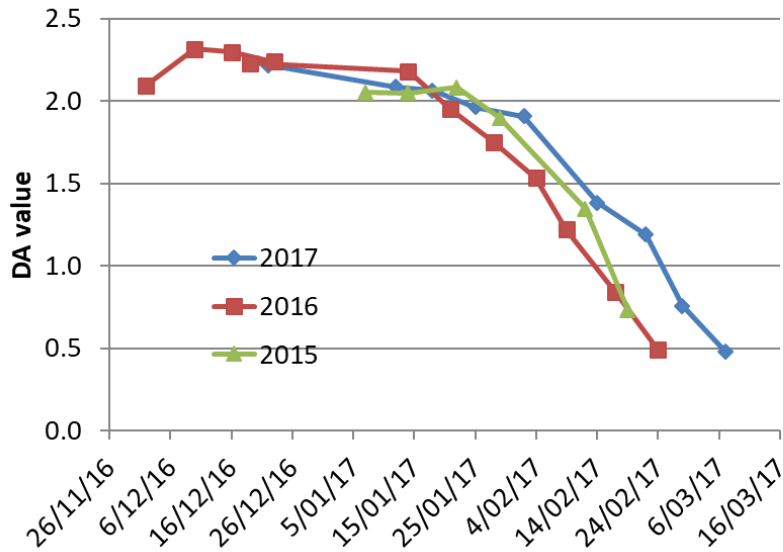


**RUBENS**  
PEAK PERFORMANCE FRUIT

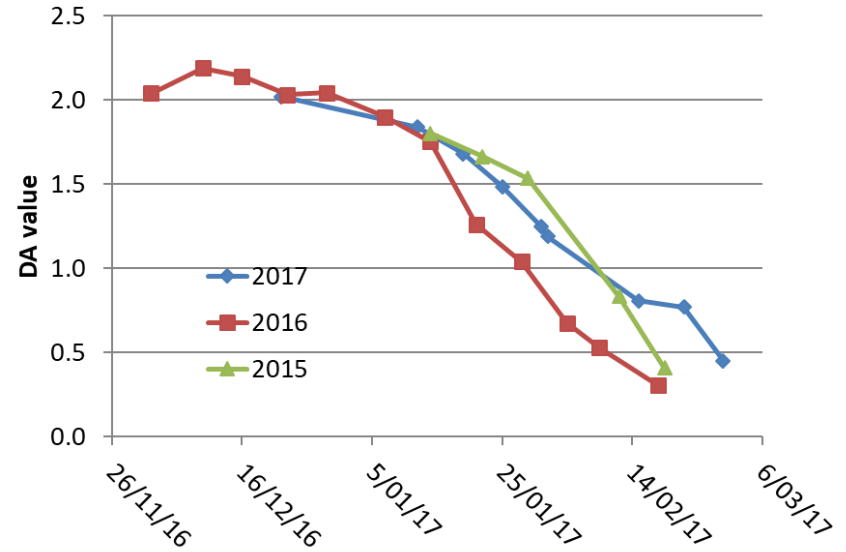


# Effect of orchard factors on maturity development

August Flame peach I<sub>AD</sub> field development 2015-17



Autumn Bright nectarine I<sub>AD</sub> field development 2015-17



T204 peach I<sub>AD</sub> field development

